REMARKS

Claims 5-10, 13, 18-24, 29-34, 42-49, 51, 53, 55, 57, 59, 61, 63, 65 and 67-69 are pending. Claims 5, 6, 7, 13, 18, 19, 20, 21, 29, 31, 42, 48, 49, 51, 53, 55, 57, 59, 61, 63, 65 and 67-68 are amended. Claims 1-4, 11, 12, 14-17, 25-28, 35-41, 50, 52, 54, 56, 58, 60, 62, 64, and 66 are canceled. Claim 69 is newly added. Applicant requests reconsideration and reexamination of the pending claims.

An object of the present invention is to provide a plasma display panel (PDP), whose image quality is maintained high by inhibiting black noise that may occur because the impedance of the dielectric protection layer changes as the panel goes through its driving period as well as to achieve a high luminance level throughout the whole panel.

The inventors have determined that the change of the impedance of the dielectric protection layer that causes black noise is caused by movement of elements such as Si, Zn, O, or Mn from the phosphor layer to the surface of the dielectric protection layer when a PDP has gone through a long driving period.

Therefore, in the present invention each phosphor layers for red, green, and blue contains a Group IV element or a transition metal, or at least one (type) of an alkali metal and an alkaline earth metal (other than Mg) by controlling a content ratio of the Group IV element, the transition metal, the alkali metal, or the alkaline earth metal. More specifically, the following content patterns are main features.

a) Each of the phosphor layers contains a Group IV element so that a content ratio of the Group IV element is within a range between 100 mass ppm and 5,000 mass ppm inclusive.

b) Each. of the phosphor layers contains a Group IV element so that a content ratio of the Group IV element is within a range between 100 mass ppm and 50,000 mass ppm inclusive, and the content ratio is substantially same for all of the phosphor layers.

c) Each of the phosphor layers contains a transition metal so that a content ratio of the transition metal is within a. range between 500 mass ppm and 30,000 mass ppm inclusive.

d) Each of the phosphor layers contains a transition metal so that a content ratio of the transition metal is within a range between 300 mass ppm and 120,000 mass ppm inclusive, and the content ratio is substantially same for all of the phosphor layers.

e) Each of the phosphor layers contains at least one (type) of an alkali metal and an alkaline earth metal (other than Mg) so that a content ratio of the at least one (type) of an alkali metal and an alkaline earth metal (other than Mg) is within a range between 1,000 mass ppm and 60,000 mass ppm inclusive.

f) Each of the phosphor layers contains at least one (type) of an alkali metal and an alkaline earth metal (other than Mg) so that a content ratio of the at least one (type) of an alkali metal and an alkaline earth metal (other than Mg) is within a range between 300 mass ppm and 120,000 mass ppm inclusive, and the content ratio is substantially same for all of the phosphor layers.

In a plasma display panel of the present invention having the above structure a), a high luminance level can be achieved and the impedance of the dielectric protection layer can be stabilized, as shown by the observations in the experiments 1 to 3, with reference to the Tables 4 to 7 in the description of the present invention.

In the same manner as this, in a plasma display panels of the present invention having each of the above structures c) and e), the same effect can be obtained as shown by the

observations in the experiments 4 to 5, with reference to the tables 8 to 10 in the description of the present invention.

Also, in a plasma display panels of the present invention having each of the above structures b), d), and f), when each of the phosphor layers contains each of the elements so that the content ratio is substantially same for all of the phosphor layers, the allowable content ratio of the element is defined as mentioned above. This can obtain the same effect of the above-mentioned effect that a high luminance level can be achieved and the impedance of the dielectric protection layer can be stabilized, as described in the fourth embodiment of the present invention.

Claim 11 is objected to as being of improper dependent form. Claim 12 is rejected under 35 U.S.C 112. Applicant has canceled Claims 11 and 12.

Claims 1-2, 11, 16, 19, 25-27, 35-36, 41 and 63-66 are rejected under 35 U.S.C. 102 (b) as being anticipated by *Hayashi et al.* (US 2002/0089284 "*Hayashi*"). Claims 3, 6, 13-15, 48, and 61-62 are rejected under 35 U.S.C. 102 (b) as being anticipated by *Suzuki et al.* (JP 2001-107045 "*Suzuki*"). The rejections under 35 U.S.C. 102(b) are overcome as follows.

Independent Claims 1, 16, 25, 27 and 35 are canceled. Thus, the rejection of these claims and their dependents under 102(b) is now moot.

The field of PDP manufacturing is a crowded art field. Thus, manufacturers are constantly looking for innovative improvements which make their products stand above competitor's products in the eyes of consumers. One such improvement relates to the present invention, where highly skilled engineers incur demands for greater density of pixels to better define images.

> "Thus when differences that may appear technologically minor nonetheless have a practical impact, particularly in a crowded field, the decision-maker must consider the obviousness of the new structure in this light."
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> *Continental Can Co. USA Inc. v. Monsanto Co.*, 20 U.S.P.Q. 2d. 1746, 1752 (Fed. Cir. 1991).

Claims 4-5 and 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Suzuki* in view of *Kaneda et al.* (US 5,156,764 "*Kaneda*"). Claims 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Hayashi* in view of *Ashizawa et al.* (JP 11-95420. "*Ashizawa*"). Claims 28-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Hayashi* in view of *Kaneda*. Claims 37-38 and 51-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Hayashi* in view of *Kim et al.* (US 6,475,049 "*Kim*"). Claims 39-40 and 57-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Hayashi* in view of *Hasegawa et al.* (US 5,454,861 "*Hasegawa*"). Claims 49-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Suzuki* in view of *Kim*. Claims 55-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Suzuki* in view of *Hasegawa*. Claims 20-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Hayashi* in view of *Hirano et al.* (US 2003/0030377). Claims 42, 44 and 67-68 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Suzuki* in view of *Kim et al.* (WO 01/31673). Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Suzuki* in view of *Kim et al.* (WO 01/31673) and *Kaneda*. Claims 45-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Suzuki* in view of *Kim et al.* (WO 01/31673) and *Shirozu* (US 2002/0050792). Applicant overcomes the rejections as follows.

Claim 5 sets forth a plasma display panel in which a pair of substrates are disposed so as to oppose each other and have a discharge space therebetween and in which a dielectric protection layer including MgO and phosphor layers for red, green, and blue respectively are formed so as to face the discharge space, "wherein each of the phosphor layers contains at least one Group IV element in an amount that causes the impedance of the dielectric protection layer to rise by a same degree over the course of time in the discharge space that corresponds to the phosphor layers red, green and blue."

When a light emission drive of a PDP is performed, in order to display an image, wall charges are generated on the surface of the dielectric protection layer in selected discharge cells during an address period, and discharges occur during a sustain period. The amount of the wall charges being accumulated is influenced by the impedance of the dielectric protection layer; therefore, when the impedance of the dielectric protection layer is too much lower or too much higher than a predetermined value, what is called "black noise" may occur, which means that discharges during the sustain period do not occur in a normal manner. Further, when the impedance is too high, in order to have discharges occur during a sustain period, it is required to apply a high voltage, and thereby the consumption electric power becomes large.

The Examiner has cited *Suzuki* for allegedly disclosing a structure in which each of phosphor layers contains a Group IV element. However, although *Suzuki* refers to Group IV elements, there is not teaching or suggestion that the Group IV element be "in an amount that causes the impedance of the dielectric protection layer to rise by a same degree over the course of time in the discharge space that corresponds to the phosphor layers red, green and blue."

Instead, *Suzuki* discloses that in order to improve coating film density a group IV element is incorporated into a phosphor mainly comprising a rare earth element to make the particle

shape of the phosphor spherical or cubical. Applicant could find no teaching or suggestion that indicates that *Suzuki* contemplated that the Group IV element should be "in an amount that causes the impedance of the dielectric protection layer to rise by a same degree over the course of time in the discharge space...."

The Examiner has cited *Kaneda* for allegedly disclosing a structure in which a content ratio of a Group IV element in phosphors is controlled so as to be in a predetermined range, in order to improve the luminance of the phosphors.

> A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (The claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result-effective variable.).
>
> MPEP §2144.05 (II)(B) (underline added)

Applicant submits that neither *Suzuki* nor *Kaneda* disclose that the amount of the Group IV element is such that it causes the impedance of the dielectric protection layer to rise by a same degree over the course of time in the discharge space that corresponds to the phosphor layers. There is no disclosure in either *Suzuki* or *Kaneda* that indicates that either contemplated that the change of the impedance of the dielectric protection layer could be caused by movement of a Group IV element (such as Si) from the phosphor layer to the dielectric protection layer.

Also, *Kaneda* discloses a structure in which a content ratio of a Group IV element in phosphor particles is controlled so as to be in a predetermined range. However, this is for achieving the objective of improving the luminance level of the phosphor particles. Therefore,

Kaneda does not consider a Group IV element contained in the phosphor layer other than the phosphor particles.

Therefore, Claim 5 is allowable over the combination of *Suzuki* and *Kaneda*.

Claim 7 is similar to Claim 5 and is also allowable for the same reasons as Claim 5. Claim 7 also includes that "the content ratio is substantially same for all of the phosphor layers."

Even if one of ordinary skill in the art where to combine *Suzuki* and *Kaneda*, it does not follow, and there is no teaching to suggest, that the content ratio of the Group IV element is substantially same for all of the phosphor layers. As a result, a structure derived from the combination of *Suzuki* and *Kaneda* would yield an impedance change of the dielectric protection layer for all of the phosphor layers which is not controlled.

Claim 18 sets forth "wherein each of the phosphor layers contains at least one transition metal, wherein a content ratio of said at least one transition metal in each of the phosphor layers is within a range between 500 mass ppm and 30,000 mass ppm inclusive."

Hayashi cited by the Examiner allegedly discloses a structure in which each of phosphor layers contains a transition metal. *Ashizawa* allegedly discloses a structure in which a developer used for patterning before calcination contains a transition metal ion or the like so that a content ratio of the transition metal ion is less than 500 ppm, in a manufacturing process of the phosphor layer.

Ashizawa discloses that the developer contains a transition metal ion or the like so that a content ratio of the transition metal ion is less than 500 ppm, and patterning is performed using the developer. As a result, erosion of the surface of the phosphor layer before calcination can be suppressed, and luminance degradation of the phosphor layer after calcination can be suppressed.

However, *Ashizawa* does not disclose the content ratio of the transition metal in the phosphor layer, but discloses only the content ratio of the transition metal ion in the developer used for patterning of the phosphor layer before calcination. Thus, the structure disclosed by *Ashizawa* is completely different from the structure of the present invention set forth in Claim 18 and does not cure the deficiency of the *Hayashi* reference.

Also, neither *Hayashi* nor *Ashizawa* disclose that the change of the impedance of the dielectric protection layer is caused by movement of a transition metal from the phosphor layer to the dielectric protection layer.

Accordingly Claim 18 is allowable over *Hayashi* in view of *Ashizawa*.

Claim 21 is similar to Claim 18 and is allowable for the same reasons as Claim 18. Claim 21 also sets forth that "the content ratio is substantially same for all of the phosphor layers."

Even if one of ordinary skill in the art where to combine *Hayashi* and *Ashizawa*, it does not follow, and there is no teaching to suggest, that the content ratio is substantially same for all of the phosphor layers. As a result, a structure derived from the combination of *Hayashi* in view of *Ashizawa* would yield an impedance change of the dielectric protection layer for all of the phosphor layers which is not controlled.

Claim 29 sets forth "wherein each of the phosphor layers contains at least one member of the group consisting of alkali metals and alkaline earth metals other than Mg in an amount that causes the impedance of the dielectric protection layer to rise by a same degree over the course of time in the discharge space that corresponds to the phosphor layers red, green and blue."

Claim 31 claims similar features and in addition that "the total content ratio is substantially same for all of the phosphor layers."

The Examiner has cited *Hayashi* which fails to disclose that the content ration is within the claimed range and alleges that *Kaneda* cures the deficiency by disclosing a structure in which each of phosphor layers contains barium.

However, *Kaneda* neither discloses nor suggests that each of phosphor layers contains at least one of an alkali metal and an alkaline earth metal (other than Mg) so that a content ratio of the at least one of an alkali metal and an alkaline earth metal (other than Mg) is within a range between 1,000 mass ppm and 60,000 mass ppm inclusive.

Moreover, neither *Hayashi* nor *Kaneda* disclose that the change of the impedance of the dielectric protection layer is caused by movement of at least one of an alkali metal and an alkaline earth metal (other than Mg) from the phosphor layer to the dielectric protection layer as set forth in both Claims 29 and 31.

Accordingly Claims 29 and 31 are allowable over *Hayashi* in view of *Kaneda*.

Claims 6, 13, 42-49, 55 and 61 depend from Claim 5 and are therefore allowable for at least the same reasons as Claim 5. Claims 8, 9 and 10 depend from Claim 7 and are therefore allowable for at least the same reasons as Claim 7. Claims 19, 20, 51, 57, 63 and 67 depend from Claim 18 and are therefore allowable for at least the same reasons as Claim 18. Claims 22, 23, 24 and 69 depend from Claim 21 and are therefore allowable for at least the same reasons as Claim 21. Claims 30, 53, 59, 65 and 68 depend from Claim 29 and are therefore allowable for at least the same reasons as Claim 29. Claims 32, 33, and 34 depend from Claim 31 and are therefore allowable for at least the same reasons as Claim 31.

For example, Claim 42 sets forth "at least part of a surface of one or more of the phosphor layers facing the discharge space is covered with a phosphor protection layer, the phosphor protection layer (i) having an ultraviolet ray transmittance rate of 80 % or higher, and

(ii) having a function of inhibiting one or more of elements included in the one or more phosphor layers that are to degrade discharge properties of the dielectric protection layer from dispersing into the discharge space."

Neither *Suzuki* alone or in combination with *Kim et al.* (WO 01/31673) discloses the feature set forth in Claim 42. Instead, *Kim et al.* discloses a phosphor protection layer 40 having a high material hardness for "enduring the ion impact sufficiently" but not for inhibiting one or more of elements included in the one or more phosphor layers that are to degrade discharge properties of the dielectric protection layer from dispersing into the discharge space. Thus, for these additional reasons Claim 42 and other dependent claims of similar scope are allowable over the cited references.

In view of the amendment to the present claims, it is believed that the case is now in condition for allowance and an early notification of the same is requested. If the Examiner believes that a telephone interview will help in the prosecution of this matter, the undersigned attorney can be contacted at the listed phone number.

Very truly yours,

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